ChemCatalyst *(Copy and answer these questions on the left page)*

- *What do you think happened to the copper powder in the copper cycle experiment when it was mixed with the nitric acid?*

$Cu + HNO_3$

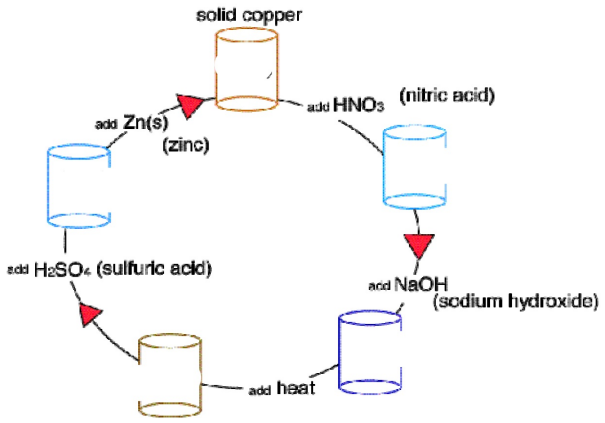
The Big Question

- What happened to the copper?

Experimental stage	Observations
1. Copper at the start	Brownish, copper-colored, fine solid.
2. After adding nitric acid (HNO_3)	Turned sky blue – liquid. Brownish gas.
3. After adding water (H_2O)	Still a blue liquid.
4. After adding sodium hydroxide (NaOH)	Clumpy dark blue.
5. After heating	Turned black. Black solid in clear liquid.*
6. After adding sulfuric acid (H_2SO_4)	Clear blue solution.
7. After adding zinc (Zn)	Bubbled. Chunks of solid appeared.
8. Final	Zinc turned black and disappeared.

Copper appeared

What you did	Chemical added Write the chemical formula	What you saw Your observations from the lab	Write the chemical formula and name of the copper compound at each stage	Where is the copper?
Got a sample of copper	Cu(s)	*orangish-brown fine powder*	Cu(s) solid copper powder	*The copper is in the beaker because the teacher put it there.*
Added nitric acid	$HNO_3(aq)$	Brown gas blue liquid	$Cu(NO_3)_2$ copper nitrate	Copper was in $Cu(NO_3)_2$
Added sodium hydroxide	NaOH	Dark-blue Chunky	$Cu(OH)_2$ copper Hydroxide	
Added heat (removes H_2O)	none	black (s) Clear (l)	CuO copper oxide	
Added sulfuric acid	H_2SO_4	light blue	$CuSO_4$ copper sulfate	
Added zinc	Zn	fizz Black copper	Cu(s) solid copper powder	



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The **subscripts** in a chemical equation indicate how many atoms are in the chemical formula for that substance.

The large numbers in front of chemical formulas are called **coefficients.** They indicate how many *parts* of that substance there are in a reaction.

$$2H_2 + O_2 \rightarrow 2H_2O$$

Notes

- An **element** is a unique form of matter that serves as a building material for more complex matter.
- When elements are combined under ordinary conditions, the elements are not destroyed. We can represent elements with symbols and keep track of them during chemical reactions.
- Elemental copper can be transformed through chemical reactions, and then recovered again.

Law of Conservation of Matter:

Matter can be neither created nor destroyed in chemical reactions. This means that in chemical reactions atoms do not come in and out of existence.

Individual atoms are conserved in chemical reactions and physical changes: the number of atoms of each element remains constant from start to finish.

Matter is conserved in chemical reactions: the total mass of the products equals the total mass of the reactants. The atoms are simply rearranged. Since atoms have mass, the mass does not change.

Making Sense (answer on left page)

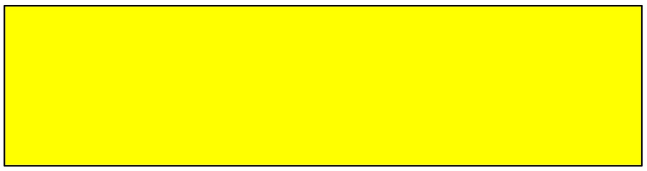
- How would you describe what happened to the copper throughout this experiment?

Notes

$HNO_3(aq)$ is added to Cu(s), resulting in

and

$Cu(NO_3)_2(aq)$ and $NO_2(g)$.



Check-In

Sodium chloride, NaCl(aq), is added to silver nitrate, $AgNO_3(aq)$, resulting in $NaNO_3(aq)$ and a white solid. Identify the white solid from the list below.

A) AgCl(s)
B) AgCl(aq)
C) $AgNO_3(s)$
D) NaCl(s)